SUMMARY PROBLEM

(a) HCl – strong acid, KOH – strong base; $HCHO_2$ – weak base, HClO – weak acid

(b) $HCl(aq) + H_2O \rightarrow H_3O^+(aq) + Cl^-(aq)$ $\quad$ $KOH(aq) \rightarrow K^+(aq) + OH^-(aq)$

$CHO_2^-(aq) + H_2O \rightleftharpoons HCHO_2(aq) + OH^-(aq)$ $\quad$ $HClO(aq) + H_2O \rightleftharpoons H_3O^+(aq) + ClO^-(aq)$

(c) $HClO/ClO^-$; $\quad$ $CHO_2^-/HCHO_2$

(d) HCl: pH = 0.67; $\quad$ KOH: pH = 13.33

HClO: $2.8 \times 10^{-8} = \dfrac{(x)(x)}{0.215 - x}$; $\quad x = [H^+] = 7.8 \times 10^{-5}$ $\quad$ pH = 4.11

$KCHO_2$: $5.3 \times 10^{-11} = \dfrac{(x)(x)}{0.215 - x}$; $\quad x = [OH^-] = 3.4 \times 10^{-6}$; $\quad$ pH = 8.53

(e) K_b for $ClO^- = \dfrac{1.0 \times 10^{-14}}{2.8 \times 10^{-8}} = 3.6 \times 10^{-7}$; $\quad$ K_a for $HCHO_2 = \dfrac{1.0 \times 10^{-14}}{5.3 \times 10^{-11}} = 1.9 \times 10^{-4}$

(f) NH_4Cl – acidic, $KClO_4$ – neutral

(g) $K_a NH_4^+ = 5.6 \times 10^{-10}$; $\quad K_b ClO^- = 3.6 \times 10^{-7}$; $\quad K_b > K_a$; $\quad$ salt is basic

PROBLEMS

1. (a) acids: H_3O^+, HCN ; bases: CN^-, H_2O ; conjugate pairs: H_3O^+, H_2O; HCN, CN^-

   (b) acids: HNO_2, H_2O ; bases: NO_2^-, OH^- ; conjugate pairs: HNO_2, NO_2^-; H_2O, OH^-

   (c) acids: $HCHO_2$, H_3O^+ ; bases: CHO_2^-, H_2O ; conjugate pairs: $HCHO_2$, CHO_2^-; H_3O^+, H_2O

3. (a) acid $\quad$ (b) acid $\quad$ (c) base

5. (a) H_2O $\quad$ (b) $H_2PO_4^-$ $\quad$ (c) NH_4^+

   (d) HF $\quad$ (e) $Zn(H_2O)_3(OH)^+$

7. As B-L acid: $H_2PO_4^-(aq) + H_2O \rightleftharpoons H_3O^+(aq) + HPO_4^{2-}(aq)$

   As B-L base: $H_2PO_4^-(aq) + H_2O \rightleftharpoons H_3PO_4(aq) + OH^-(aq)$

9. (a) $Ni(H_2O)_5OH^+(aq) + H_2O \rightleftharpoons H_3O^+(aq) + Ni(H_2O)_4(OH)_2(aq)$

   (b) $Al(H_2O)_6^{3+}(aq) + H_2O \rightleftharpoons H_3O^+(aq) + Al(H_2O)_5(OH)^{2+}(aq)$

   (c) $H_2S(aq) + H_2O \rightleftharpoons H_3O^+(aq) + HS^-(aq)$

(d) $HPO_4^{2-}(aq) + H_2O \rightleftharpoons H_3O^+(aq) + PO_4^{3-}(aq)$

(e) $HClO_2(aq) + H_2O \rightleftharpoons H_3O^+(aq) + ClO_2^-(aq)$

(f) $Cr(H_2O)_5OH^+(aq) + H_2O \rightleftharpoons H_3O^+(aq) + Cr(H_2O)_4(OH)_2(aq)$

11. (a) $NH_3(aq) + H_2O \rightleftharpoons OH^-(aq) + NH_4{}^+(aq)$

(b) $NO_2^-(aq) + H_2O \rightleftharpoons OH^-(aq) + HNO_2(aq)$

(c) $C_6H_5NH_2(aq) + H_2O \rightleftharpoons OH^-(aq) + C_6H_5NH_3^+(aq)$

(d) $CO_3^{2-}(aq) + H_2O \rightleftharpoons OH^-(aq) + HCO_3^-(aq)$

(e) $F^-(aq) + H_2O \rightleftharpoons OH^-(aq) + HF(aq)$

(f) $HCO_3^-(aq) + H_2O \rightleftharpoons OH^-(aq) + H_2CO_3(aq)$

13. (a) pH = -0.78, pOH = 14.78; acidic

(b) pH = 0.48, pOH = 13.52; acidic

(c) pH = 7.34, pOH = 6.66; basic

(b) pH = 13.14, pOH = 0.86; basic

15. (a) $1 \times 10^{-4}\ M$; $1 \times 10^{-10}\ M$

(b) $3.0 \times 10^{-9}\ M$; $3.3 \times 10^{-6}\ M$

(c) $1.0\ M$; $1.0 \times 10^{-14}\ M$

(b) $2.5 \times 10^{-13}\ M$; $4.0 \times 10^{-2}\ M$

17. (a) $[OH^-] = (1.0 \times 10^{-14})/(2.4 \times 10^{-8}) = 4.2 \times 10^{-7}$; pOH = 6.38 ; pH = 7.62 ; basic

(b) $[H^+] = (1.0 \times 10^{-14})/(1.9 \times 10^{-2}) = 5.26 \times 10^{-13}$; pH = 12.28 ; pOH = 1.72 ; basic

(c) $[H^+] = 2.4 \times 10^{-9}$; $[OH^-] = (1.0 \times 10^{-14})/(2.4 \times 10^{-9}) = 4.17 \times 10^{-6}$; pOH = 5.38; basic

(d) $[OH^-] = 6.02 \times 10^{-13}$; $[H^+] = (1.0 \times 10^{-14})/(6.02 \times 10^{-13}) = 0.017$; pH = 1.78; acidic

19. Solution 1 is more acidic. Solution 2 has the higher pH.

21. $[H^+]_X = 4.5 \times 10^{-5}$; $[OH^-]_X = 2.2 \times 10^{-10}$

$[H^+]_Y = 4.5 \times 10^{-6}$; $[OH^-]_Y = 10(2.2 \times 10^{-10}) = 2.2 \times 10^{-9}$

$[H^+]_Z = 4.5 \times 10^{-9}$; $[OH^-]_Z = 2.2 \times 10^{-6}$

(a) $[H^+]_X/[H^+]_Y = 4.5 \times 10^{-5}/4.5 \times 10^{-6} = 10$; $[H^+]_X/[H^+]_Z = 4.5 \times 10^{-5}/4.5 \times 10^{-9} = 1.0 \times 10^4$

(b) $(pH)_Y = 5.35$; $(pH)_Z = 8.35$

(c) X and Y are acidic, Z is basic.

23. rain water: $[H^+] = 3 \times 10^{-6}$; acid rain : $[H^+] = 1 \times 10^{-3}$; ratio $= 1 \times 10^{-3}/3 \times 10^{-6} = 3 \times 10^2$

25. (a) $\text{mol } OH^- = 0.25 \text{ g } Ba(OH)_2 \times \dfrac{1 \text{ mol } Ba(OH)_2}{171.3 \text{ g } Ba(OH)_2} \times \dfrac{2 \text{ mol } OH^-}{1 \text{ mol } Ba(OH)_2} = 2.9 \times 10^{-3}$

$[OH^-] = \dfrac{0.0029 \text{ mol}}{0.655 \text{ L}} = 0.0045\ M$; pOH = 2.35 ; pH = 11.65

(b) mol KOH = (0.300 L)(0.149 mol/L) = 0.0447 ; M of diluted sol'n = 0.0447 mol/3.00 L = 0.0149

pOH of concentrated solution = 0.83; pH of concentrated solution = 13.17

pOH of diluted solution = 1.83; pH of diluted solution = 12.17

pH decreases by 1.00 unit

27. (a) $[OH^-] = 0.27\ M\ Sr(OH)_2 \times \dfrac{2 \text{ mol } OH^-}{1 \text{ mol } Sr(OH)_2} = 0.54$

$[H^+] = 1.0 \times 10^{-14}/0.54 = 1.9 \times 10^{-14}$; pH = 13.73 ; pOH = 0.27

(b) mol OH^- = mol KOH = (13.6 g)(1 mol/56.1 g) = 0.242 ; $[OH^-] = \dfrac{0.242 \text{ mol}}{2.50 \text{ L}} = 0.0970\ M$

$[H^+] = 1.00 \times 10^{-13}$; pH = 13.00 ; pOH = 1.00

29. mol H^+ from HNO_3 = mol HNO_3 = (0.786 mol/L)(0.295 L) = 0.232

mol H^+ from HI = mol HI = (5.00 g)(1 mol/127.9 g) = 0.0391

$[H^+] = \dfrac{(0.232 + 0.0391) \text{ mol}}{0.295 \text{ L}} = 0.919\ M$; pH = 0.037

31. mol OH^- from NaOH = mol NaOH = (13.0 g)(1 mol/40.0 g) = 0.325

mol OH^- from $Sr(OH)_2$ = 2(mol $Sr(OH)_2$) = 2(0.200 mol/L)(0.795 L) = 0.318

$[OH^-] = \dfrac{(0.325 + 0.318) \text{ mol}}{0.795 \text{ L}} = 0.809\ M$; pOH = 0.0921; pH = 13.91

33. (a) $PH_4^+(aq) \rightleftharpoons H^+(aq) + PH_3(aq)$ $\quad K_a = \dfrac{[H^+][PH_3]}{[PH_4^+]}$

(b) $HS^-(aq) \rightleftharpoons H^+(aq) + S^{2-}(aq)$ $\quad K_a = \dfrac{[H^+][S^{2-}]}{[HS^-]}$

(c) $HBrO_2(aq) \rightleftharpoons H^+(aq) + BrO_2^-(aq)$ $\quad K_a = \dfrac{[H^+][BrO_2^-]}{[HBrO_2]}$

35. (a) $K_a \approx 1 \times 10^{-4}$ (b) 7.6×10^{-11} (c) 8.5×10^{-14}

37. (a) D > A > C > B (b) D

39. $HClO < HC_7H_5O_2 < HNO_2 < HNO_3$

41. $HNO_3 < HNO_2 < HC_7H_5O_2 < HClO$

43. $[H^+] = 4.6 \times 10^{-3} = [B^-]$; $[HB] = 0.129 - 4.6 \times 10^{-3} = 0.124$

$$K_a = \frac{(4.6 \times 10^{-3})(4.6 \times 10^{-3})}{0.124} = 1.7 \times 10^{-4}$$

45. M of caproic acid = (0.450 mol)/2.0 L = 0.225 ; $K_a = \dfrac{(1.7 \times 10^{-3})(1.7 \times 10^{-3})}{0.225 - (1.7 \times 10^{-3})} = 1.3 \times 10^{-5}$

47. mol $HC_6H_7O_6$ (HAsc) = $\dfrac{2.00 \text{ g}}{176.1 \text{ g/mol}}$ = 0.0114 ; $[HAsc]_o = \dfrac{0.0114 \text{ mol}}{0.100 \text{ L}} = 0.114\ M$; $[H^+]_{eq} = 0.0029\ M$

$$K_a = \frac{(0.0029)(0.0029)}{0.114 - 0.0029} = 7.6 \times 10^{-5}$$

49. $1.2 \times 10^{-5} = \dfrac{[H^+][Al(H_2O)_5OH^{2+}]}{1.75}$; $[H^+] = [Al(H_2O)_5OH^{2+}]$; $[H^+] = 0.0046\ M$; pH = 2.34

51. (a) $1.51 \times 10^{-5} = \dfrac{[H^+]^2}{0.279 \text{ mol}/1.30 \text{ L}}$ $\quad [H^+] = 1.80 \times 10^{-3}\ M$

(b) mol butyric acid = $\dfrac{13.5 \text{ g}}{88.1 \text{ g/mol}}$ = 0.153 ; M butyric acid = $\dfrac{0.153 \text{ mol}}{1.30 \text{ L}}$ = 0.118 mol/L

$1.51 \times 10^{-5} = \dfrac{[H^+]^2}{0.118}$ $\quad [H^+] = 1.33 \times 10^{-3}\ M$

53. (a) $5.1 \times 10^{-6} = \dfrac{[H^+]^2}{0.894\ M}$ $[H^+] = 2.1 \times 10^{-3}\ M$

(b) $[OH^-] = \dfrac{1.0 \times 10^{-14}}{2.1 \times 10^{-3}} = 4.8 \times 10^{-12}\ M$

(c) pH = 2.68

(d) % ionization = $\dfrac{2.1 \times 10^{-3}}{0.894} \times 100 = 0.23\%$

55. (a) [phenol] = $\dfrac{(14.5/94.1)\ \text{mol}}{0.892\ \text{L}} = 0.173\ M$; $[H^+]^2 = (1.1 \times 10^{-10})(0.173) = 1.9 \times 10^{-11}$

$[H^+] = 4.4 \times 10^{-6}$; pH = 5.36

(b) % ionization = $\dfrac{4.4 \times 10^{-6}}{0.173} \times 100 = 0.0025\%$

57. $H_2C_2O_4(aq) \rightleftharpoons 2\,H^+(aq) + C_2O_4^{2-}(aq)$

$K = K_1K_2 = (5.9 \times 10^{-2})(5.2 \times 10^{-5}) = 3.1 \times 10^{-6}$

59. $2.7 \times 10^{-4} = \dfrac{[H^+][HA^-]}{[H_2A]}$; $[H^+] = [HA^-]$; $[H^+]^2 = (2.7 \times 10^{-4})(0.20)$

$[H^+] = [HA^-] = 7.3 \times 10^{-3}\ M$; pH = 2.13; $[A^{2-}] = K_{a2} = 8.3 \times 10^{-7}\ M$

61. $1.2 \times 10^{-3} = \dfrac{[H^+][HC_8H_4O_4^-]}{[H_2C_8H_4O_4]}$; $[H^+] = [HC_8H_4O_4^-]$; $[H^+]^2 = (1.2 \times 10^{-3})(2.9)$

$[H^+] = [HC_8H_4O_4^-] = 5.9 \times 10^{-2}\ M$; pH = 1.23; $[C_8H_4O_4^{2-}] = K_{a2} = 3.9 \times 10^{-5}\ M$

63. (a) $F^-(aq) + H_2O \rightleftharpoons HF(aq) + OH^-(aq)$ $K_b = \dfrac{[HF][OH^-]}{[F^-]}$

(b) $HCO_3^-(aq) + H_2O \rightleftharpoons H_2CO_3(aq) + OH^-(aq)$ $K_b = \dfrac{[H_2CO_3][OH^-]}{[HCO_3^-]}$

(c) $CN^-(aq) + H_2O \rightleftharpoons HCN(aq) + OH^-(aq)$ $K_b = \dfrac{[HCN][OH^-]}{[CN^-]}$

65. $H_2PO_4^- < NO_2^- < CO_3^{2-}$

67. (b) < (c) < (a) < (d)

69. (a) $K_b = 1.0 \times 10^{-14}/0.16 = 6.2 \times 10^{-14}$ (b) $K_b = 1.0 \times 10^{-14}/0.20 = 5.0 \times 10^{-14}$

71. $K_b = \dfrac{[OH^-][HCO_3^-]}{[CO_3^{2-}]}$; $[OH^-] = [HCO_3^-]$; $[OH^-]^2 = (2.1 \times 10^{-4})(0.28)$

$[OH^-] = 0.0077$; pOH = 2.11 ; pH = 11.88

73. (a) $Cod(aq) + H_2O \rightleftharpoons CodH^+(aq) + OH^-(aq)$

(b) $K_b = \dfrac{1.0 \times 10^{-14}}{1.2 \times 10^{-8}} = 8.3 \times 10^{-7}$

(c) $K_b = \dfrac{[OH^-][CodH^+]}{[Cod]}$; $[OH^-] = [CodH^+]$; $1.7 \times 10^{-9} = \dfrac{[OH^-]^2}{2.0 \times 10^{-3}}$

$[OH^-] = 4.1 \times 10^{-5}\ M$; $[H^+] = 2.4 \times 10^{-10}\ M$; pH = 9.62

75. pOH = 14.00 − 11.68 = 2.32 ; $[OH^-] = 4.8 \times 10^{-3}\ M$

$1.8 \times 10^{-5} = \dfrac{(4.8 \times 10^{-3})(4.8 \times 10^{-3})}{[NH_3]}$; $[NH_3] = 1.3\ M$

mol NH_3 = (1.3 mol/L)(1.25 L) = 1.6 ; mass NH_3 = (1.6 mol)(17.0 g/mol) = 27 g

77. (a) $NiCl_3$, $Ni(NO_3)_3$ (b) NaF, $NaNO_2$

(c) $NaClO_4$, $KClO_4$ (d) NH_4Cl, NH_4NO_3

79. (a) basic (b) slightly acidic (c) acidic (d) basic (e) neutral

81. (a) $CO_3^{2-}(aq) + H_2O \rightleftharpoons HCO_3^-(aq) + OH^-(aq)$

(b) $NH_4^+(aq) \rightleftharpoons NH_3(aq) + H^+(aq)$ $K_a = 5.6 \times 10^{-10}$

$F^-(aq) + H_2O \rightleftharpoons HF(aq) + OH^-(aq)$ $K_b = 1.4 \times 10^{-11}$

(c) $H_2PO_4^-(aq) \rightleftharpoons HPO_4^{2-}(aq) + H^+(aq)$ $K_a = 6.2 \times 10^{-8}$

$H_2PO_4^-(aq) + H_2O \rightleftharpoons H_3PO_4(aq) + OH^-(aq)$ $K_b = 1.4 \times 10^{-12}$

(d) $NO_2^-(aq) + H_2O \rightleftharpoons HNO_2(aq) + OH^-(aq)$

83.

NaF	>	$Ba(NO_3)_2$	>	NH_4NO_3	>	$Al(NO_3)_3$	>	HNO_3
weak base		neutral		weak acid		weak acid		strong acid

85. $[OH^-] = (0.20\ M)(0.05) = 0.010\ M$; $K_b = \dfrac{(0.010)^2}{0.20 - 0.010} = 5.3 \times 10^{-4}$

87. mol aspirin = $\dfrac{0.648\text{ g}}{180.15\text{ g/mol}} = 3.60 \times 10^{-3}$; $V = \dfrac{1}{16}\text{ qt} \times \dfrac{1\text{ L}}{1.057\text{ qt}} = 0.0591\text{ L}$

[aspirin] = 3.60×10^{-3} mol/0.0591 L = 0.0609 M

$[H^+]^2 = (3.6 \times 10^{-4})(0.0609 - [H^+])$; The assumption that $H^+ \ll 0.0609$ is not valid.

Using the quadratic equation or the method of successive approximations, $[H^+] = 0.0045\ M$; pH = 2.35

89. Assume 100.0 g of solution. $V_{sol'n} = \dfrac{100.0\text{ g}}{1.10\text{g/mL}} = 90.9\text{ mL}$; mass of HY = (100)(0.330) = 33.0 g

mol HY = $\dfrac{33.0\text{ g}}{100\text{ g/mol}} = 0.330$; [HY] = 0.330 mol/0.0909 L = 3.63 M

$2.0 \times 10^{-8} = \dfrac{[H^+]^2}{3.63}$; $[H^+] = 2.7 \times 10^{-4}\ M$; pH = 3.57

91. No, K_W will be larger - endothermic reaction

$$\ln \frac{K_W\text{ at }37°C}{1.0 \times 10^{-14}} = \frac{55.8\text{ kJ/mol}}{0.00831\text{ kJ/mol}\cdot\text{K}}\left(\frac{1}{298\text{ K}} - \frac{1}{310\text{ K}}\right); \quad K_W\text{ at }37°C = 2.4 \times 10^{-14}$$

$[H^+]^2 = 2.4 \times 10^{-14}$; $[H^+] = 1.5 \times 10^{-7}$; pH = 6.81

93. mol OH^- = 2(mol $Mg(OH)_2$) = $2\left(\dfrac{1.2\text{ g}}{58.31\text{ g/mol}}\right) = 0.0412$

$[H^+] = 0.032\ M$; mol H^+ = (0.032 mol/L)(0.200 L) = 0.0063 mol need to be neutralized

Since there are 0.0412 mol of OH^-, there is enough $Mg(OH)_2$ to neutralize the stomach acid.

95. neutral; $[H^+] = [OH^-]$

97. (a) T (b) F (c) T (d) T (e) T

99. 1: 2 H^+, 3 HX — K_a = 4/3 = 1.3 — strongest acid

2: 3 H^+, 10 HX — K_a = 9/10 = 0.9 — smallest K_a, lowest pH

3: 2 H^+, 4 HX — K_a = 4/4 = 1.0

101. 1 H^+, 1 A^-, 9 HA

103. H^+ from first ionization = 0.020M

Second ionization: x = $[H^+]$ = $[SO_4^{2-}]$; $HSO_4^-(aq) \rightleftharpoons H^+(aq) + SO_4^{2-}(aq)$

$0.010 = \dfrac{(0.020 + x)(x)}{0.020 - x}$; $x = 0.0056$; $H^+_{tot} = 0.020 + 0.0056 = 0.0256$ pH = 1.59

104. (a) $H^+(aq) + OH^-(aq) \rightarrow H_2O$ $\Delta H^\circ = -55.8$ kJ

$$\Delta H = 1.00\ \text{L} \times 0.100\ \frac{\text{mol}}{\text{L}} \times \frac{-55.8\ \text{kJ}}{1\ \text{mol}} = -5.58\ \text{kJ}$$

(b) $HF(aq) + OH^-(aq) \rightarrow H_2O + F^-(aq)$ $\Delta H^\circ = -68.3$ kJ

$$\Delta H = 1.00\ \text{L} \times 0.100\ \frac{\text{mol}}{\text{L}} \times \frac{-68.3\ \text{kJ}}{1\ \text{mol}} = -6.83\ \text{kJ}$$

105. mol H^+ = (0.45 L)(0.12 mol/L) = 0.054

mol OH^- = 2(mol $Ba(OH)_2$) = 2(0.30 L)(0.233 mol/L) = 0.14

mol OH^- not neutralized = 0.14 − 0.054 = 0.086

$[OH^-] = \dfrac{8.6 \times 10^{-2}\ \text{mol}}{(0.30 + 0.45)\ \text{L}} = 0.11\ M$; pOH = 0.94 ; pH = 13.06

106. % ionization = $\dfrac{[H^+]}{[HA]_o} \times 100$; $[H^+]^2 = K_a \times [HA]_o$; $[H^+] = (K_a)^{\frac{1}{2}} \times ([HA]_o)^{\frac{1}{2}}$

% ionization = $\dfrac{(K_a)^{\frac{1}{2}}}{([HA]_o)^{\frac{1}{2}}} \times 100$

107. Consider 1000.0 g of solution: 950.0 g H_2O and 50.0 g $HC_2H_3O_2$

mol $HC_2H_3O_2$ = $\dfrac{50.0\ \text{g}}{60.05\ \text{g/mol}} = 0.833$

before ionization: $m = \dfrac{0.838\ \text{mol}}{0.950\ \text{kg}} = 0.877$

volume of solution = $\dfrac{1000.0\ \text{g}}{1.006\ \text{g/mL}} = 994$ mL

$[HC_2H_3O_2]$ = 0.833 mol/0.994 L = 0.838 M ; $[H^+] = \left[(0.838)(1.8 \times 10^{-5})\right]^{\frac{1}{2}} = 0.0039\ M$

For H^+ $M \approx m$; total molality = 0.0039 + 0.0039 + (0.877 − 0.0039) = 0.881 m

ΔT_f = (1.86°C/m)(0.881 m) = 1.64°C ; T_f = −1.64°C

108. molarity of $Ca(OH)_2$: $M = \dfrac{(1.53/74.10)\text{ mol}}{1.00\text{ L}} = 0.0206$

$[OH^-] = 2[Ca(OH)_2] = 2(0.0206) = 0.0412\ M$; pOH = 1.39 ; pH = 12.61

109. mol HA = $\dfrac{11\text{ g}}{138\text{ g/mol}} = 0.080$; [HA] = 0.080 mol/0.745 L = 0.107 M

mol HB = $\dfrac{5.00\text{ g}}{72.0\text{ g/mol}} = 0.0694$; [HB] = 0.0694 mol/0.525 L = 0.132 M

K_a HA = $[H^+]^2/0.107$; $[H^+]^2 = (0.107)K_a$ HA

K_a HB = $[H^+]^2/0.132$; $[H^+]^2 = (0.132)K_a$ HB

$(0.107)K_a$ HA = $(0.132)K_a$ HB

Assume K_a HB = 1 ; K_a HA = $\dfrac{(0.132)(1)}{0.107} = 1.23$

K_a HA > K_a HB ; HA is stronger.